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## PREPARATION OF CABBAGE FOR MARKET



**T**HE DEVELOPMENT within the past few decades of large cabbage-producing sections in the Southern and Western States, in addition to the increased acreage in the old-established areas in the northern districts, has increased materially the market supplies of cabbage. Consequently, growers and shippers have found it necessary to give closer attention to the marketing of this crop.

The purpose of this bulletin is to discuss the operations involved in preparing cabbage for market, and to recommend various methods that have proven satisfactory.

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# PREPARATION OF CABBAGE FOR MARKET.<sup>1</sup>

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## MARKET TYPES OF CABBAGE.

CABBAGE may be classified commercially into five distinct types: Danish, domestic, pointed, red, and savoy. This classification is based entirely upon terms adopted by the trade and has no direct connection with horticultural varieties or the regions where grown. The first three types have the greatest commercial importance.

The term Danish or Hollander is commonly applied to the solid-headed, late-maturing cabbage, which is generally used for storage and late-marketing purposes. Heads of this type usually have the leaves closely compacted and overlapping at the crown. They are comparatively smooth and solid around the base between the midribs of the leaves, even after successive head leaves have been stripped off. The heads are usually round or oval, but at times are somewhat flattened. The outline of the head as seen from above is smooth and regular. The midribs of the outer leaves generally extend outward and upward at an angle from the stalk, so that the base of the head appears rounded or elongated.

Domestic cabbage is usually not as compact as Danish, but the heads are reasonably hard. They are flat or round, and when the crown leaf is removed the head appears somewhat angular in outline. The leaves are usually crinkled or curled and do not overlap so far at the crown as in Danish cabbage. The head is usually somewhat soft at the base between the midribs of the leaves. The leaves tend to form a right angle with the stalk or they even droop or curve downward slightly before curling upward to form and envelop the head, thus giving the base of the head a flattened appearance.

The shape of the heads, particularly those of Danish type, is subject to considerable variation, dependent upon soil, climatic, or cultural conditions, so that at times it is difficult to distinguish heads

<sup>1</sup> For a more complete discussion of the marketing of cabbage see Department Bulletin No. 1242: Marketing Cabbage, by A. E. Cance and G. B. Fiske. Copies may be secured from the United States Department of Agriculture, Washington, D. C.

of Danish cabbage from those of domestic type when judged by the shape alone. The most accurate method of differentiation under these conditions is to base the identification largely upon the characteristics displayed by a vertical cross section through the center of the head. The typical characters of these two types of cabbage are shown in Figures 1, 2, 3, and 4.

Early maturing varieties of domestic are grown almost entirely for marketing as fresh cabbage. Late summer or fall varieties are grown both for market and sauerkraut purposes. Both Danish and domestic types are grown extensively in the North and West, and domestic is produced to some extent in the Southwest.

The pointed type is readily recognized by the conical or pointed shape of the head, together with the comparatively smooth surface and greenish color of the leaves. The pointed type makes up the largest proportion of the acreage in the southeastern districts, and is grown to some extent in a few of the Western States. The two most important varieties of this type are illustrated in Figures 5 and 6.

The red type is known by its red or purple color. Heads of the dark red or purple varieties are as hard as Danish cabbage, but the lighter red varieties are only fairly hard, or in this respect are comparable to the domestic round type. Red cabbage is grown to a limited degree in New York and Wisconsin and is used principally for pickling and salad.

The savoy type is grown only in small quantities. The normal crumpling or blistering of the leaf tissue throughout the leaves and head make it readily identified. The heads are of a yellowish-green color and as a rule are not much more compactly formed than head lettuce, although some varieties are reasonably hard. It is a fairly important crop near New York City and on Long Island.

### TIME AND METHODS OF HARVESTING.

In the northern sections the solidity of the head is the usual characteristic by which the proper state to harvest is determined, although with some varieties the color is also a factor, the crown or top of the head turning a lighter shade of green about the time of full development. Cabbage is usually considered ready to cut when the green cover leaves begin to curl back slightly, exposing the whiter leaves beneath. Cabbage at this stage is about as hard and heavy as it will become without bursting and without being too crisp and brittle for good handling.

Cabbage grown as a truck crop frequently is harvested as soon as it has attained sufficient size to be placed upon the market, regardless of its stage of maturity. Growers, especially in southern areas, often harvest the heads while they are still soft, in order to secure higher prices at the beginning of the season, but in most cases this results in a considerable loss in tonnage. Moreover, the quality of the product is inferior. Shipment of such stock has the effect of weakening the market and incidentally limiting demand, since it causes the consumer to curtail his purchases. Stock cut when soft or immature wilts badly, and when displayed for sale presents an unattractive appearance. On the other hand, cabbage that is not harvested soon enough becomes overripe and necessitates close trim-



FIG. 1.—Cross section of typical head of Danish or Hollander cabbage. Leaves are very compact. The leaf midribs extend outward and upward from the stem. In the flatter types of Danish or Hollander this is not so pronounced.

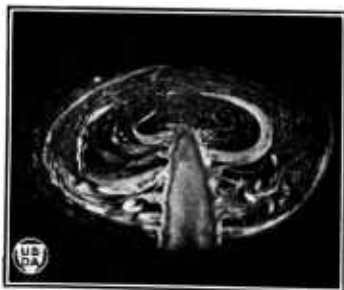


FIG. 2.—Cross section of typical head of domestic cabbage. The leaves are not so compactly formed as in Danish. The leaf midribs form a right angle with the stem or curve downward slightly.

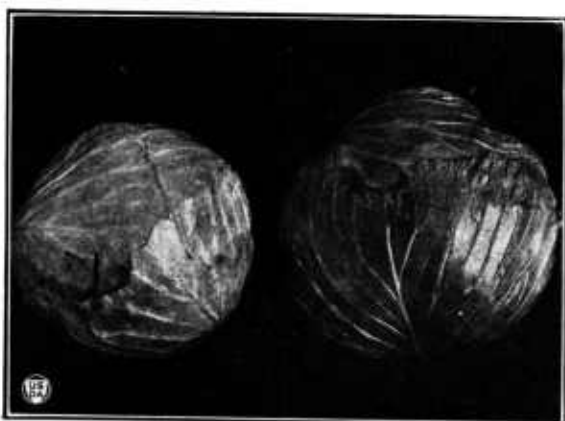


FIG. 3.—Danish cabbage (left) is smoothly circular in outline as viewed from above. Domestic cabbage (right) is somewhat angular in outline.

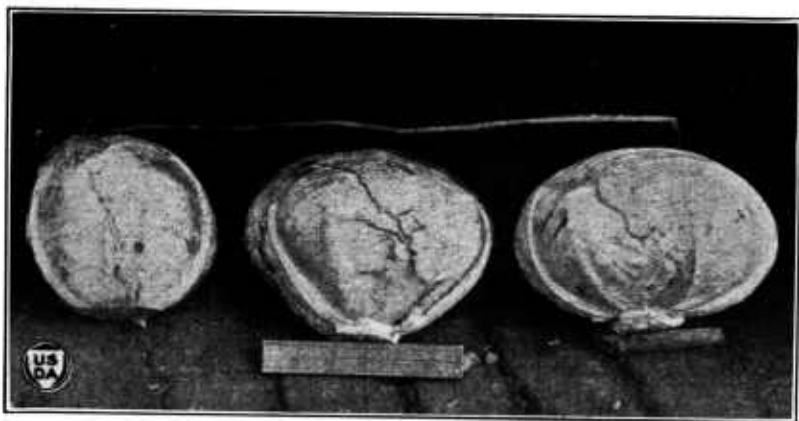


FIG. 4.—Three heads of Danish or Hollander cabbage, illustrating the typical round, balloon, and oval shapes.

ming. Such heads have a white appearance and are very tender. They are too brittle for long shipment.

The common practice throughout the northern cabbage sections is to allow the crop to stand until all of it can be harvested at one or



FIG. 5.—The short, squatty head on the left is Charleston Wakefield. The abruptly pointed head on the right is Jersey Wakefield.

two cuttings. Throughout the South and those sections supplying the midseason market, two or more cuttings are necessary, because in these districts the ripening often extends over a long period.



FIG. 6.—Cross section of head of Charleston Wakefield cabbage. The air spaces between the leaves are typical of pointed cabbage.

In the northern districts, harvesting of Danish or Hollander cabbage often continues until the middle of November, in which event freezing temperatures may occur before the harvesting is com-

pleted. The outer leaves which show evidence of freezing injury are trimmed off before loading. In case the freezing extends into the head, cutting should be discontinued for a time. If favorable weather follows, the heads will thaw, and may show no evidence of injury when the outer leaves are trimmed off.

The most common method of harvesting is to sever the head from the stem with a large butcher knife. (Fig. 7.) Some growers use hatchets, long-handled spades, tobacco shears, or knives of various descriptions, commonly patterned after the semicircular chopping knife or meat cleaver. In some sections a long-handled, spade-like knife, known locally as a "spud," is a popular harvesting tool.

Cutting tools with long handles permit the harvesting to be done with comparative ease and rapidity, but are not conducive to careful work, as many of the heads are cut either with too long a stem or with part of the base chopped off. The use of a heavy knife is more satisfactory. Heads with deep slices cut off at the stem end, and with the loose outer leaves falling readily from the heads as a result of such practice, detract materially from the good appearance of a carload, to say nothing of the increased likelihood of decay.

Cabbage intended for immediate shipment should be trimmed to two to four close-fitting wrapper leaves, as shown in the center in Figure 8. Any leaves showing material damage from worms, disease, or other means should be removed, even though it necessitates close trimming. The green outer leaves serve to protect the heads and may be removed at destination if necessary to give the lot a fresh appearance. Stems should be one-quarter to one-half inch in length.

In harvesting late-crop cabbage the usual procedure is to cut and trim the heads at one operation, rolling several rows into one. When loading these trimmed heads into the wagon a reasonable amount of care should be exercised in order to prevent bruising. Bruised tissues become watery in appearance and later turn dark, often followed by decay. The heads should not be allowed to fall into the wagon bed, but should be tossed to an extra man on the wagon and placed carefully on the load.

In southern sections, where it is customary to ship cabbage in hampers or crates, the containers are often packed in the field as the heads are cut. In the Carolinas and Virginia it is customary to throw the heads into carts which are driven ahead of the cutters.



FIG. 7.—Common method of harvesting is to sever the head from the stem with a large butcher knife.



Each man follows two or three rows and cuts the heads that are sufficiently developed. The carts are unloaded at some convenient place, where the cabbage is graded and packed into the containers.

### NECESSITY OF CAREFUL GRADING.

Care should be exercised in the handling of cabbage, whether it is to be shipped in containers or in bulk. The attractiveness of a neatly trimmed, carefully graded lot of cabbage more than pays for the extra time and attention required in its preparation.

No one factor is more important in marketing fruits and vegetables than careful grading. High standards, consistently adhered to, build good will and create confidence. Definite grades are coming into general use in many sections in preparing cabbage for market. It is recognized increasingly by growers and shippers that



FIG. 8.—Head on left is poorly trimmed, one in center is well trimmed, and one on right is closely trimmed.

fresh, sound, firm cabbage brings higher returns than soft, puffy, leafy, or worm-eaten heads, and that it pays well to discard such defective heads before shipping. They should be left in the field at time of cutting. The arrival on the markets of large quantities of cabbage that is poorly graded or in bad condition quickly depresses the demand, while, on the other hand, deliveries of uniformly good quality stimulate increased consumption.

When cabbage is loaded in bulk, small, puffy, burst, worm-eaten, or otherwise defective heads, as shown in Figure 9, may be returned to the wagon along with the loose leaves that have been trimmed off or that have shattered off in handling. A slight amount of retrimming at time of loading is sometimes necessary.

Small or medium-weight cabbage is the most desirable market size. Heads of pointed cabbage weighing 1 to 4 pounds and heads of Danish and domestic cabbage weighing 2 to 6 pounds are preferred by receivers. When loading in bulk, a certain amount of

sizing can be done at the car, as most shippers in the Northern States instruct their loaders to reject all heads estimated to weigh less than 2 pounds. Heads weighing more than 8 pounds are undesirable.

Extreme irregularity in size should be avoided. Shipments from northern sections often are especially selected for size, grading "small," "medium," or "small to medium." In some cases, where the field run shows a considerable number of large heads, the largest are hauled separately. Shippers frequently load out straight cars from one field, a practice which often results in a more uniform grade and size than if the car were loaded from several fields without grading.

In districts where cabbage is packed in containers for shipment, whatever grading and sizing is done must occur, of course, before the heads are packed. The packer can do a certain amount of grading, although this discarding of defective stock can be done at less expense in the field.

When cabbage is shipped in containers it is particularly important to pack large heads separately from small and medium heads, rather

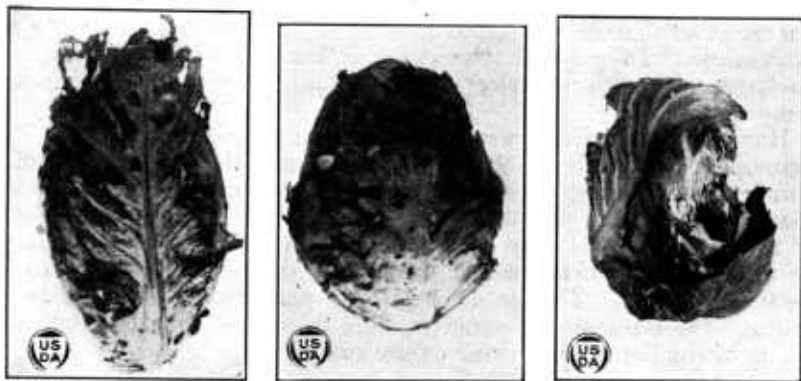


FIG. 9.—Burst heads and heads showing slime or bad worm injury should be discarded.

than to place all sizes in the same package. In some sections, notably the southern Ohio district, it is customary to size the cabbage in this way before packing, with the result that the crop finds a more ready market and brings increased returns. The retail trade prefers fairly uniform sizes because it is easier to set a price on each head and because uniform sizes permit the selection of crates containing the sizes wanted. The premium paid for the medium sizes usually more than offsets any discount on the very small and very large heads and pays well for the slight increase in the time required in the sorting and packing operations.

The Department of Agriculture has prepared standard specifications for cabbage which provide for two grades, U. S. No. 1 and U. S. No. 2. The difference between the two grades relates to market quality rather than to size, the size being stated in addition to the grade. These standards provide that heads of cabbage which meet the quality requirements of the U. S. No. 1 grade may be designated as U. S. No. 1 Small, U. S. No. 1 Small to Medium,

U. S. No. 1 Medium, U. S. No. 1 Medium to Large, or U. S. No. 1 Large, depending upon the weight of the heads.<sup>2</sup>

These standards furnish a common terminology that may be used in describing a given shipment of cabbage, and provide a basis for contracts, sales, inspections, adjustments, etc. It may readily be seen that if a lot of cabbage is described as U. S. No. 1 Medium, a clear and definite understanding of both the quality and size of the cabbage comprising the shipment may be had by both buyer and seller without actually seeing the lot. The intelligent use of standardized grades not only minimizes the possibilities for misunderstanding but also for fraud, deception, and sharp practice. Several important cabbage-producing States have adopted the Federal cabbage standards as official State standards, using them as the basis for official inspections.

### GOOD CONTAINERS HELP TO SELL.

Shipments originating in the early producing States and in some of the mid-season sections are made extensively in containers. These are of several different types and of a great variety of sizes and dimensions. In general, the crate is the most popular shipping package, although barrels, hampers, and even sacks are used to some extent.

Hampers and barrels are rapidly being replaced by crates. The principal objections to these containers are that they are not as sturdy as the crate, their shape makes them more difficult to load than a rectangular package, they do not allow sufficient ventilation of the contents, and they do not permit the cabbage to be displayed as effectively. Furthermore, they lend themselves readily to deceptive packing. The nature of these packages is such as to encourage the tendency of some packers to conceal small or defective heads in the bottom or center of the container.

Throughout the United States more than 24 different sizes or styles of cabbage crates are in use. In Tennessee, a pony crate, holding approximately 60 pounds, is used. One of about 80 pounds net weight is frequently used for the shipment of California cabbage to eastern markets. In other sections crates holding 140 and even 180 pounds are used. The crate most commonly employed holds about 100 pounds and has approximately the same volume as a standard barrel, but even with a crate of this capacity the dimensions are extremely variable.

The confusion resulting from this large variety of crates is great, and the need for some reduction in the number is apparent. It is hoped that eventually the various cabbage crates may be standardized into four types which will fit the requirements of all sections and at the same time do away with the extensive variety of sizes and dimensions. The four recommended types are illustrated in Figures 10 to 13, inclusive. Their dimensions and capacities are as follows:

<sup>2</sup> The Federal grades for cabbage may be subject to further revision and therefore are not given here. Copies may be secured from the Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C.

Type.	Inside dimensions (inches).	Length of slat (inches).	Capacity (cubic inches).
Atlantic coast.....	12 by 18 by 33	36	7,128
Mississippi Valley.....	16 by 16 by 28	30	7,168
Colorado.....	21 by 22 by 24	24	11,088
California.....	18 by 18 by 23½	24½	7,695

These are all single-compartment crates with the exception of the Atlantic coast type, which is equipped with a center head, dividing the crate into two compartments.

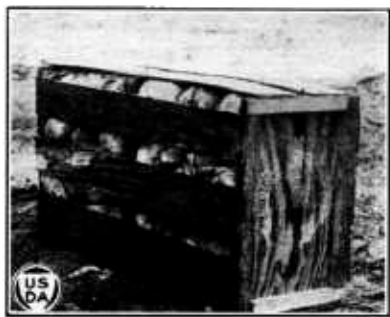


FIG. 10.—Atlantic coast type of cabbage crate.



FIG. 11.—Mississippi valley type of cabbage crate.



FIG. 12.—Colorado type of cabbage crate.



FIG. 13.—California type of cabbage crate.

Cabbage crates should be neatly and securely constructed of substantial material. Flimsy or damaged containers present a poor appearance and often give rise to extra handling and rehandling after arrival in the markets.

The heads should be placed in the crate with the stems out, and should be arranged in orderly layers. They should be pressed firmly but carefully into position so as to make a tight pack. Crushing and excessive bruising should be avoided. The crate should be well-filled so that the cover slats will show a slight bulge, thus preventing damage from shifting of the contents during handling and in transit.

**METHODS OF LOADING CARS.**

Some shipments from southern points and most of the early fall shipments from the North are made in stock cars or in box cars, but when shipments are expected to encounter extremes of temperature refrigerator cars are used if available. In mild weather the doors of box and stock cars are fastened open, and the doorways slatted across to hold the stock in place, but when freezing weather approaches the doors are closed, the cars are lined with paper, and the load is embedded in a layer of straw. Occasionally provision is made for heating the car. Bulk shipments are usually loaded 3 to 5 feet deep throughout the entire length of the car, and consist of 12 to 14 tons. In winter the cars are frequently bulkheaded and braced between the doors with no cabbage loaded in the door-

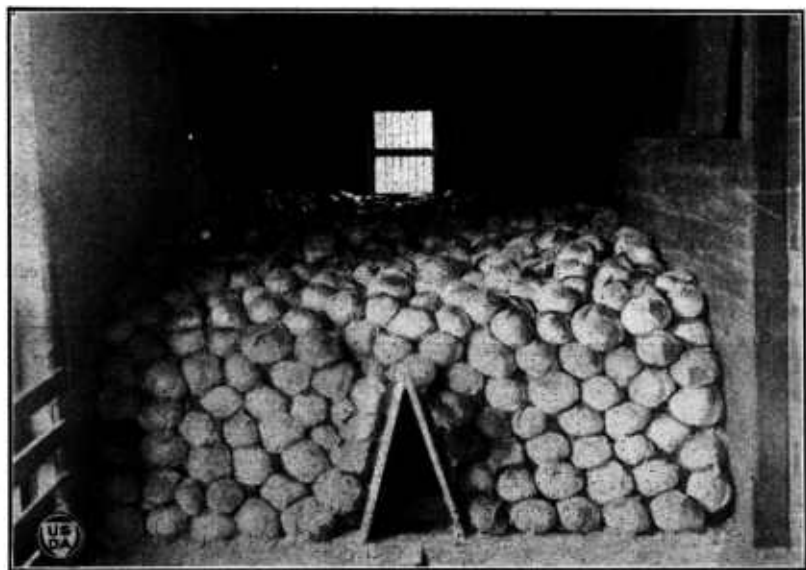


FIG. 14.—A ventilating frame permits free circulation of air throughout the bulk load.

way. This reduces the likelihood of freezing injury and also facilitates the handling of the stock in the car when received in the market.

Thorough ventilation is essential. In refrigerator cars slatted false floors should be used. For early fall shipments from the Northern States and for bulk shipments from Texas, shippers usually place an A-shaped, slatted ventilator shaft throughout the entire length of the car. These ventilators are constructed along the floor in the center of the car before loading. There is little uniformity in their dimensions, but the most common type is  $2\frac{1}{2}$  to 3 feet high and about  $1\frac{1}{2}$  to 2 feet across the base. (Fig. 14.) In loading cars thus equipped, it is advisable to leave about 2 or 3 feet of the frame open at the top between the doorways to permit the free

circulation of air in the car, thereby reducing the possibility of the top of the load becoming discolored during transit.

A common method of loading cars for bulk shipment is to place each head individually as it is received from the wagon, carrying the cabbage back from the door in baskets or crates. This generally requires two men in the car, but serves the very useful purposes of preventing bruising and making the carload appear to good advantage. The load is usually built up in successive benches 3 to 5 feet in width, extending across the car. The heads are carefully arranged with stems down in such a way as to form a smooth slanting face to each bench. Cars loaded carefully in this way are neat and attractive. In some cases only the heads forming the front of the bench are placed individually, the remainder of the bench being built up without regard to the position of the heads. The practice of load-



FIG. 15.—Crates loaded in a car should be evenly spaced and securely stripped.

ing by tossing the heads indiscriminately into the car causes much bruising and mechanical injury, and thus increases the possibility of the development of decay in transit. Cars loaded in such a way are unattractive in appearance.

When loading crated cabbage, a space of 2 inches or more should be left between the rows of packages, each layer of crates being stripped crosswise of the car with 1-inch strips (or plaster laths doubled), securely nailed to the tops of the crates. This spacing is essential in order to permit free circulation of air throughout the load. The load should be firmly constructed so that no shifting or breakage may occur in transit. (Fig. 15.)

A common mistake in loading hampers is to place them on their sides five or six layers high. As a result the containers in the bottom of the load usually become crushed in transit, as shown in Figure 16. If loaded on end, two or three layers high, with tops and bottoms alternating, these packages will carry fairly well.



FIG. 16.—Damage frequently occurs in transit when hampers are loaded on the sides.

The following table indicates the number of packages per car:

Containers.	Number packages per car. (Range).	Usual num- ber of pack- ages per car. (Approx- imate).
Barrels, 100 to 110 pounds.....	200 to 250	200
Crates:		
Atlantic coast type, 100 to 125 pounds.....	200 to 220	210
Mississippi Valley type, 100 to 125 pounds.....	200 to 220	210
Colorado type, 140 to 175 pounds.....	160 to 180	200
California type, 105 to 125 pounds.....	180 to 210	150
Texas type, 150 to 200 pounds.....	132 to 175	400
Pony type, 60 pounds.....	425 to 550	450
Hampers, 1½ bushels, approximately 30 pounds.....		

## HANDLING CABBAGE FOR SAUERKRAUT MANUFACTURE.

The sauerkraut industry is confined almost exclusively to producing States in the North. In general, only domestic type cabbage is used for sauerkraut, although at times a portion of the Danish crop is consumed in this way. Extremely large heads of Danish are frequently diverted to the sauerkraut factories. Large, well-matured, closely trimmed heads are preferred by the manufacturer. As a rule, little care is exercised in handling cabbage intended for immediate use by factories.

METHODS OF STORING CABBAGE.<sup>3</sup>

Only Danish or Hollander cabbage can be stored without excessive shrinkage and the bulk of the tonnage used for this purpose is grown in New York and Wisconsin. Houses in which cabbage is stored are more or less frost proof in construction, and are fitted with ventilators in the roof and along the walls at the ground. A driveway extends through the center of the house with a row of bins along each side, as illustrated in Figure 17. These bins are commonly 3 to 4 feet in width with double-slatted partitions between, so constructed as to give approximately 6 inches of ventilating space between the bins from top to bottom. (Fig. 18.) In some houses these compartments are considerably wider, in which case the cabbage is generally stored on slatted racks which fit into the bins. From one to four layers of heads are placed on each rack and an air space of a few inches is left between the top layer of cabbages and the rack above. These racks aid greatly in the ventilation but add to the expense of handling and reduce the storage capacity of the house.

During severe weather it frequently is necessary to make provision for heating these storage houses. Stoves and coke heaters of the salamander type are usually employed. If the open coke heater is used the fire is lighted outside the building and the salamander is moved inside after the smoke has cleared away. During severe weather or periods of wide fluctuations in temperature, storage houses require frequent attention.

Cabbage to be stored should be green and solid, and should not show any yellowing, decay, mechanical injury, or other defects. If stored in these specially built warehouses, the heads should be trimmed to three to six tight wrapper leaves. Loose leaves interfere with ventilation, and thorough ventilation is essential.

In some northern sections field storage is practiced extensively. The cabbage is cut with the stem one-half inch or more in length, leaving several loose wrapper leaves. The heads are placed one layer deep on well-drained sod land, closely packed together with the stems down, and covered with a few inches of straw or hay, the depth of which is increased as the weather becomes colder.

In addition to these types of storage, considerable quantities are held for short periods in barns or cellars, or piled outside in long

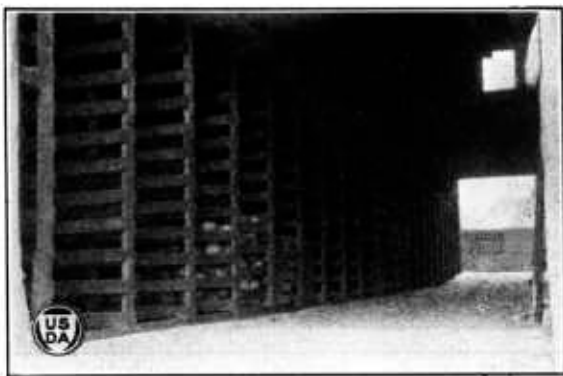


FIG. 17.—Usual arrangement of bins in cabbage storage house.

<sup>3</sup> For further information regarding the storage of cabbage, see Farmers' Bulletin 433, Cabbage.



ricks or against strawstacks. The cabbage is stacked 3 or 4 feet high against a ventilating rack or A-shaped frame, and is then covered deeply with straw.

Upon removal from storage for shipment the stems are recut, and enough outer leaves are trimmed off to eliminate all defects and to give the heads a fresh appearance.

### GOVERNMENT INSPECTION OF CABBAGE.

The development of the Federal fruit and vegetable inspection service in the past few years has been of great benefit in promoting fair and equitable business relations between buyers and sellers. The scope of this service was recently extended to include the inspection of cabbage at loading points in several States, and one of the

most noticeable and far-reaching results has been the standardization of the shipments that originate in the sections where this service is available. The inspections are all made on the basis of the United States grades. Detailed information concerning the Government inspection of fresh fruits and vegetables may be secured upon application to the Food Products Inspection Service, Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C.

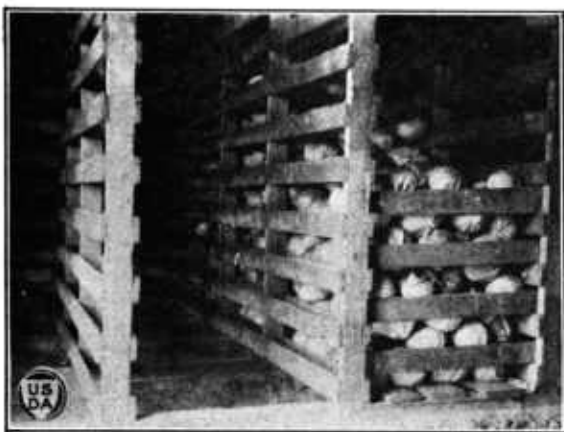


FIG. 18.—Approximately 6 inches of ventilating space is provided between the bins.

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Although constant improvement is noticeable in the methods employed in preparing cabbage for market, and although many individuals and organizations exercise scrupulous care in maintaining their high standards, nevertheless the wide variation in the quality and condition of cabbage shipments that reach the terminal markets in the United States forces the conclusion that many shippers are still failing to devote as much attention to this phase of marketing as it deserves. In sections where standardized grades have been employed intelligently and consistently, marketing conditions have shown a decided improvement. It would seem, therefore, that the adoption of uniform and efficient methods of harvesting, grading, loading, and handling generally would be beneficial to all factors concerned in the distribution of cabbage.